

Atty Docket No.: TKHR1020

Serial No.: 09/768,483

**REMARKS****Present Status of the Application**

The Office Action rejected claims 1, 2, and 7. Specifically, the Office Action rejected claims 1 and 2 under 35 U.S.C. 102 (b) as being anticipated by Roberts et al. (U. S. Patent 5,801,858; hereinafter Roberts). The Office Action rejected claim 7 under 35 U.S.C. 103 (a) as being unpatentable over Roberts in view of Chen (U. S. Patent 5,809,190). Applicant has amended claims. After entry of amendments, claims remain pending in the present application, and reconsideration of those claims is respectfully requested.

**Discussion of Rejections of Office Action**

The Office Action rejected claims 1 and 2 under 35 U.S.C. 102 (b) as being anticipated by Roberts. The Office Action rejected claim 7 under 35 U.S.C. 103 (a) as being unpatentable over Roberts in view of Chen. Applicant respectfully traverses the rejections for at least the reasons set forth below.

The present invention as recited in claims 1-2, the uni-directional optical function module, such as an optical amplifier, has the optical isolator, so as to have high isolation function when the optical function module is adapted with multiple different wavelengths. Here, the first channel adapts, for example, a set of odd number wavelengths, and the second channels adapts, for example, a set of even number wavelengths.

The present invention should be considered as a whole for the operation under

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multi-wavelengths.

In re Roberts, Fig. 1b only discloses single wavelength for S1 in one transmitting direction or for S2 in the opposite transmitting direction. The issues for operation for multiple different wavelengths have not been disclosed or considered. Clearly, the optical amplifier 15 of Roberts is not specifically required to have high isolation function achieved by the optical isolator.

With respect to claim 7, even though MWDM may be disclosed by Chen, Chen does not supply the motivation to modify Roberts into multi-window for the WDM. Further still, Chen also failed to disclose the missing features in Roberts about the isolation function. Even if Chen is combined with Roberts, the foregoing missing features are still at least not disclosed.

#### Alternative Discussions

The present invention is 4-port Multi-channel WDM but the Roberts disclose a 4-port Thin Film Filter (TFF) WDM. These two WDM's are different. The isolator is also not disclosed in Prior art. Applicant provides the alternative discussions as follows:

**1. What are the differences between using 4-port Thin Film Filter (TFF) WDM as the wavelength management module and using 4-port Multi-channel WDM (interleaver) as wavelength management module in the present invention?**

**a. Low Reflective Isolation while using 4-port Thin Film Filter (TFF) WDM**

The Fig. 1B in U.S. Patent 5,801,858 is based on Phillip E. Baker (U.S. Patent 5,452,124;

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col. 1, line 54-55). The wavelength management module used in that patent is 4-port Thin Film Filter (TFF) WDM. The drawback of this component is low reflective isolation (typical 15 dB). It means that some residue of the signal carried by  $\lambda_2$  will propagate with the signal carried by  $\lambda_1$  to East side after amplifying. It cannot be applied into real telecom system because of low isolation ( $-10 \cdot \log[(\text{power of } \lambda_2)/(\text{power of } \lambda_1)]$ ) which is lower than the minimal requirement (22dB) in telecommunication.

The present invention disclose the 4-port Multi-window WDM as the wavelength management module. It will be easy to get 25 dB isolation because the signals pass through the 4-port Multi-window WDM twice times.

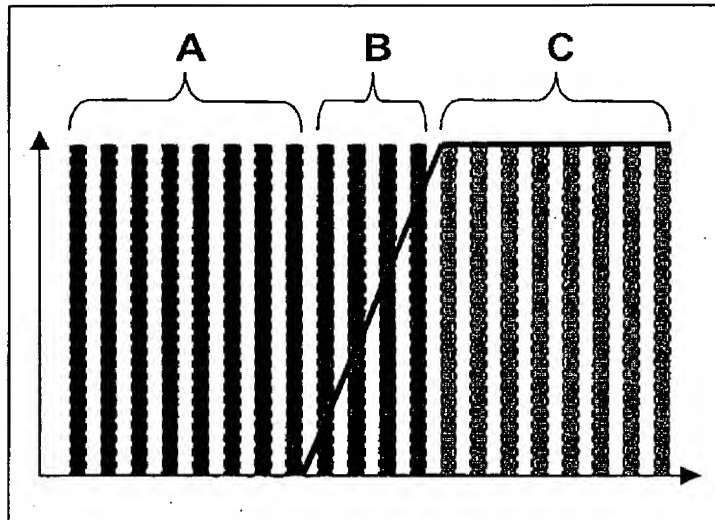
**b. Mechanicism for expanding single channel application to multi-channel application**

If one wants to expand single channel application to multi-channel application by using conventional TFF WDM, then he should enlarge pass band of TFF or narrow down channel spacing of the signals. In terms of the characteristics of TFF, he must give up some channels, which are marked B shown in following Figure 1, because of high loss or low isolation for these channels.

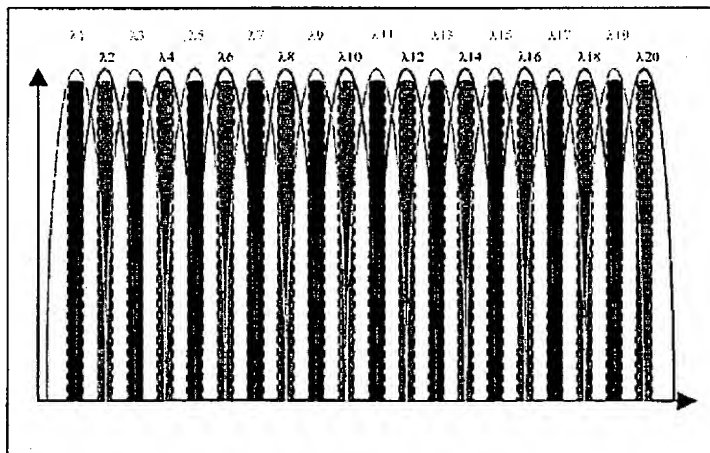
If one use 4-port Multi-window WDM (interleaver) as the wavelength management module, what we should do is just to set suitable channel spacing of the signals. It is easy to be applied to single channel application or multi-channel application based on the optical characteristics of 4-port Multi-window WDM (See Figure 2).

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**Figure 1.** The channels marked by A are reflective signals, which propagate in downstream while the channels marked by C are passed signals, which propagate in upstream. The channels marked by B should be abandoned due to the limitation of TFF.



**Figure 2.** The channels marked by odd number ( $\lambda_1, \lambda_3, \dots$ ) propagate in downstream while the channels marked by even number ( $\lambda_2, \lambda_4, \dots$ ) propagate in upstream. All of the channels can be used in the full band.

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**2. Why is it not easy to apply the concept of 3-port Multi-window WDM, which is disclosed by Chen (U.S. Patent 5,809,190) directly as the wavelength management module?**

The Present invention is nonobvious to the prior art for at least the following reasons.

Chen discloses the method of fabrication of fused Multi-window WDM and how to cascade different kinds of Multi-window WDM to make multiplexer (MUX) or DEMUX. It should pass two criteria shown as follows if Chen wants to apply Multi-window WDM as the wavelength management module in multi-channel bi-direction transmission.

**Criteria 1: Be familiar with the symmetric feature of 4-port Multi-window WDM in wavelength arrangement**

It is easy for those who have studies Chen's patent (U.S. Patent 5,809,190) to understand how wavelengths are arranged in 3-port Multi-window WDM and fit the purpose of MUX/DEMUX. It is slightly complicated to transfer directly the concept of 3-port Multi-window WDM to that of 4-port Multi-window WDM because it should take much time and many experiments to be familiar with the symmetric feature of 4-port Multi-window WDM in wavelength arrangement. For example, what is the output port if we launch the signals marked by even number into the port of Multi-window WDM, which has been assigned to the signals marked by odd number? (See Figure 3)

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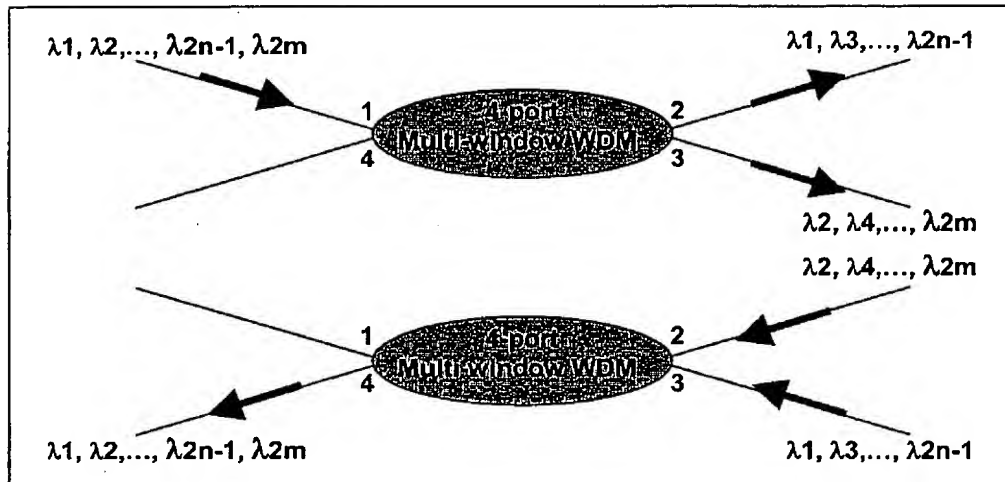


Figure 3. The symmetric feature of 4-port Multi-window WDM

**Criteria 2: Add optical isolator in behind of optical function module to keep unidirectional transmission in the loop of optical function module in order to avoid the interference effect between the signal and residue of the signal**

It is unnecessary for EDFA to add extra optical isolator because EDFA already has isolators inside. It is a coincidence, but we still need to add optical isolator in behind of optical function module (including OADM, optical cross-connect and so on, which are without optical isolator inside) to avoid the interference effect between the signal and residue of the signal. We also did some experiments to prove how crucial it is.

In the alternative discussion, the Roberts failed to disclose the 4-port multi-channel WDM. The present invention is also nonobvious to Chen to modify Roberts into the claimed invention.

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For at least the foregoing reasons, Applicant respectfully submits that independent claim 1 patently define over the prior art, and should be allowed. For at least the same reasons, dependent claims 2 and 7 patently define over the prior art as well.

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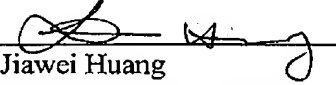
CONCLUSION

For at least the foregoing reasons, it is believed that all the pending claims 1, 2, and 7 of the invention patentably define over the prior art and are in proper condition for allowance. If the Examiner believes that a telephone conference would expedite the examination of the above-identified patent application, the Examiner is invited to call the undersigned.

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